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**From:** Jennings, Eleanor [Eleanor.Jennings@parsons.com]  
**Sent:** 6/22/2017 11:28:19 PM  
**To:** d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; Davis, Eva [Davis.Eva@epa.gov]; Dan Pope [DPope@css-inc.com]; Wayne Miller [Miller.Wayne@azdeq.gov]; Steve Willis [steve@uxopro.com]; Bo Stewart [Bo@Praxis-Enviro.com]  
**CC:** Cosler, Doug [Doug.Cosler@TechLawInc.com]; Brasaemle, Karla [Karla.Brasaemle@TechLawInc.com]  
**Subject:** RE: Williams - ST012 - Period ending 5/12 report

OK, folks, get comfortable....

Environmental methane is, at best, semi-qualitative when it comes to microbial activity. The main issue is that unlike in a stoppered serum bottle sitting on a lab-bench, methane moves around in the environment. A lot. So just because you measure methane in one place, that doesn't mean it was generated there. Also, methane gets trapped in pockets (the entire basis for methane-capture for energy at landfills, for example) that can show highly inflated amounts if you happen to sample it. So yes, the huge amounts of methane they are proposing as evidence of current microbial activity may actually just be pockets trapped from long ago (to an extreme, these trapped-gas pockets are basis of the natural gas industry).

Per our checklist, the baseline microbial analyses would remove this question, as some of the microbial metrics (PLFAs) only look at currently-alive bacteria. However, as of now, I still haven't seen any evidence to confirm the current presence of a live, active, COC-degrading population.

What also has me worried is the comment today by AMEC about multiple-times the amount of sulfate-reduction occurring when methanogenesis is also occurring. Not necessarily. Yes, the two processes may occur simultaneously, but evidence of one is not evidence of the other.

- First, assuming that any active microbial population is still alive at the site (and I'll get to the temperature issues in a minute), it's possible that these supposedly huge amounts of methane are in fact from an active methanogenic population that is surviving in an environment that is so reduced (making methanogens extra-happy) that sulfate-reduction has ceased. To have methanogens extra-happy, as they are claiming, sulfate-reducers are not no happy.

- Second, their entire EBR assumption of needing to supplement the environment with sulfate assumes sulfate is limiting ... which would have driven down the population size of sulfate-reducers because they essentially would have starved to death due to a lack of this nutrient. In short, the entire reason they want to do sulfate-based EBR is to bring back (which assumes it's not currently there at any significant level) the SRB population. In other words, assuming that there are large populations of methanogens (and I'm not saying there is), this does not necessarily mean that there are significant levels of sulfate-reducers. If I had to guess, given past experience with this project, somebody with AMEC read a paper that said that methanogens and sulfate-reducers were found in tandem at some hydrocarbon site, and so they assumed the same must be true here. Without a shred of actual evidence to support the idea for this site under current conditions.

Ok, stop the teeth-grinding, stop the teeth-grinding, stop the teeth-grinding....

Onto the temperature issue. If areas of the site are increasing in temp by 1-degree (F or C? It's not in today's slides), that's not good. Yeah, a 1-degree C or F bump up or down won't really hurt any bacteria, but the issue comes in if this increase KEEPS happening, and the temps creep up past the threshold that these bacteria can survive. Are there sulfate-reducers able to survive at 200C - yep. They are in hot thermal springs such as in Yellowstone, and have lived happily there for eons. But, as we've talked about before, these critters have had eons to adapt to these temperatures. We have no evidence that our population at our site was able to handle the rapid increase and then maintenance of temps during SEE. I go back to the issue of not actually having evidence of who (if anyone, from a bacterial stand-point) is currently there and what their capabilities are.

I do agree that it would be good to get a map of thermal conditions, overlaid with where they plan to treat. If you look at the checklist we sent them, we ask for temperature data before, during, and after EBR for new and existing MWs.

These are important issues, and since they go back to our checklist, I say we make sure to bring them up when the checklist is discussed. I have a feeling that will be a pretty intense discussion, and won't be short, and so I liked the idea proposed on today's call that we have a call with AF before next month's regular call. Plus, it gets these items off of the table and dealt with without all of the other site data to discuss. Just my thoughts.

- E

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"Safety Isn't Expensive. It's Priceless."

-----Original Message-----

From: d'Almeida, Carolyn K. [mailto:dAlmeida.Carolyn@epa.gov]  
Sent: Thursday, June 22, 2017 6:00 PM  
To: Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-inc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>; Bo Stewart <Bo@Praxis-Enviro.com>  
Cc: Cosler, Doug <Doug.Cosler@TechLawInc.com>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>  
Subject: RE: Williams - ST012 - Period ending 5/12 report

That's why they made the effort today to demonstrate how much methane they are pulling out as evidence that biodegradation is occurring. But I still think the key question is why is the trend in methane production declining from initial record right after SVE startup. Does this represent methane production from decades of biodegradation before SEE which they just now recovered, and is tapering off as it is extracted, and maybe does not reflect current biological conditions?

Carolyn d'Almeida  
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Federal Facilities Branch (SFD 8-1)  
US EPA Region 9  
(415) 972-3150

"Because a waste is a terrible thing to mind..."

-----Original Message-----

From: Davis, Eva  
Sent: Thursday, June 22, 2017 2:31 PM  
To: Dan Pope <DPope@css-inc.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>; Bo Stewart <Bo@Praxis-Enviro.com>  
Cc: Cosler, Doug <Doug.Cosler@TechLawInc.com>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>  
Subject: RE: Williams - ST012 - Period ending 5/12 report

You people need to see where the high temperatures are in relation to where they plan on trying to treat

-----Original Message-----

From: Dan Pope [mailto:DPope@css-inc.com]  
Sent: Thursday, June 22, 2017 4:29 PM  
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Davis, Eva <Davis.Eva@epa.gov>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>; Bo Stewart <Bo@Praxis-Enviro.com>  
Cc: Cosler, Doug <Doug.Cosler@TechLawInc.com>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>  
Subject: RE: Williams - ST012 - Period ending 5/12 report

Sounds reasonable to me.

-----Original Message-----

From: d'Almeida, Carolyn K. [mailto:dAlmeida.Carolyn@epa.gov]  
Sent: Thursday, June 22, 2017 4:27 PM  
To: Davis, Eva; Dan Pope; Wayne Miller; Jennings, Eleanor; Steve Willis; Bo Stewart  
Cc: Cosler, Doug; Brasaemle, Karla  
Subject: RE: Williams - ST012 - Period ending 5/12 report

Just a guess, but I think the concern is a 1 degree change in temp over course of day could be a stressor on the bugs that are present in that location. I suspect they realize that EBR wont be effective in the SEE treatment area because it is too hot, that's why they are focusing on the perimeter. And if they do significant extraction, the temperature redistribution will kill off the bugs that are present.

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"Because a waste is a terrible thing to mind..."

-----Original Message-----

From: Davis, Eva  
Sent: Thursday, June 22, 2017 2:10 PM  
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Dan Pope <DPope@css-inc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>; Bo Stewart <Bo@Praxis-Enviro.com>  
Cc: Cosler, Doug <Doug.Cosler@TechLawInc.com>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>  
Subject: FW: Williams - ST012 - Period ending 5/12 report

I have a real disconnect on this - hope the microbiologists on the call know more about this than I do - they are concerned that a 1F/day temperature increase in the extraction wells could affect the microbial population, but they think the temps out there (see attached report and look at where the TMPs are relative to where they plan on pumping) aren't a problem? Can those bugs work at temps up to 200F?

-----Original Message-----

From: Smallbeck, Donald R. [mailto:Donald.Smallbeck@amecfw.com]  
Sent: Monday, June 12, 2017 10:06 AM  
To: 'Wayne Miller' <Miller.Wayne@azdeq.gov>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>  
Cc: JERRARD, CATHERINE V CIV USAF HAF AFCEC/CIBW <catherine.jerrard@us.af.mil>; Pearson, Stuart C. <Stuart.Pearson@amecfw.com>; 'steve@uxopro.com' <steve@uxopro.com>; Davis, Eva <Davis.Eva@epa.gov>; d p <DPope@css-dynamac.com>; 'Brasaemle, Karla' <KBrasaemle@TechLawInc.com>; Levine, Herb <Levine.Herb@epa.gov>  
Subject: Williams - ST012 - Period ending 5/12 report

BCT members

Please find attached for your information the preliminary report describing ST012 activities for the period from April 29 thru May 12, 2017.

D.R. Smallbeck

Principal Program Manager

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